

WHAT IS CLAIMED IS:

- 5 1. A fiber which comprises:
a thermoplastic polymer; and
particles of a ferroelectric material dispersed therein.
- 10 2. The fiber of Claim 1, in which the particles of a ferroelectric material are present at a level of from about 0.01 to about 50 percent by weight, based on the weight of the fiber.
- 15 3. The fiber of Claim 1, in which the fiber has been exposed to an electric field.
4. The fiber of Claim 1, in which the thermoplastic polymer is a polyolefin.
5. The fiber of Claim 4, in which the polyolefin is polypropylene or polyethylene.
- 20 6. The fiber of Claim 1, in which the particles of the ferroelectric material have a longest dimension in a range of from about 10 nanometers to about 10 micrometers.
- 25 7. The fiber of Claim 1, in which the ferroelectric material is selected from the group consisting of perovskites, tungsten bronzes, bismuth oxide layered materials, and pyrochlores.
8. The fiber of Claim 7, in which the ferroelectric material is barium titanate.
- 30 9. A multicomponent fiber comprised of two or more components, each of which is comprised of a thermoplastic polymer, wherein at least one component is comprised of a thermoplastic polymer and particles of a ferroelectric material dispersed therein.

10. The multicomponent fiber of Claim 9, in which the particles of a ferroelectric material are present at a level of from about 0.01 to about 50 percent by weight, based on the weight of the fiber.

5 11. The multicomponent fiber of Claim 9, in which the multicomponent fiber has been exposed to an electric field.

10 12. The multicomponent fiber of Claim 9, in which the particles of the ferroelectric material have a longest dimension in a range of from about 10 nanometers to about 10 micrometers.

13. The multicomponent fiber of Claim 9, in which the ferroelectric material is selected from the group consisting of perovskites, tungsten bronzes, bismuth oxide layered materials, and pyrochlores.

15 14. The multicomponent fiber of Claim 13, in which the ferroelectric material is barium titanate.

20 15. The multicomponent fiber of Claim 9, in which the multicomponent fiber is a bicomponent fiber in which the two components are arranged in a side-by-side configuration.

25 16. The multicomponent fiber of Claim 9, in which the multicomponent fiber is a bicomponent fiber in which the two components are arranged in a sheath-core configuration.

17. The multicomponent fiber of Claim 9, in which the thermoplastic polymer is a polyolefin.

30 18. The multicomponent fiber of Claim 17, in which the polyolefin is polypropylene or polyethylene.

19. A nonwoven web comprised of the fiber of Claim 1.

20. The nonwoven web of Claim 19, in which the nonwoven web has been exposed to an electric field.

21. A nonwoven web comprised of the multicomponent fiber of Claim 9.

22. The nonwoven web of Claim 21, in which the nonwoven web has been exposed to an electric field.

23. A method of preparing fibers containing particles of a ferroelectric material, the method comprising:

destructuring the ferroelectric material in the presence of a liquid and a surfactant to give destructured particles, wherein the liquid is a solvent for the surfactant and the surfactant is adapted to stabilize the destructured particles against agglomeration;

forming a blend of the stabilized, destructured ferroelectric material particles and a thermoplastic polymer; and

extruding the blend to form fibers.

24. The method of Claim 23, in which the thermoplastic polymer is a polyolefin.

25. The method of Claim 23, in which the particles of a ferroelectric material are present at a level of from about 0.01 to about 50 percent by weight, based on the weight of the fiber.

26. The method of Claim 23 which further comprises exposing the fibers to an electric field.

27. The method of Claim 23, in which the destructured particles of the ferroelectric material have a longest dimension in a range of from about 10 nanometers to about 10 micrometers.

28. The method of Claim 23, in which the ferroelectric material is selected from the group consisting of perovskites, tungsten bronzes, bismuth oxide layered materials, and pyrochlores.

5 29. The method of Claim 28, in which the ferroelectric material is barium titanate.

10 30. The method of Claim 23, which further comprises collecting the extruded fibers on a moving foraminous support to form a nonwoven web.

31. The method of Claim 30 which further comprises exposing the nonwoven web to an electric field.

15 32. The method of claim 23 which further comprises melting the blend of the stabilized, destructured ferroelectric material particles and a thermoplastic polymer and melt extruding the molten blend to form fibers.

20 33. The method of claim 23 which further comprises adding a solvent for the thermoplastic polymer to the blend to form a solution of the thermoplastic polymer having dispersed therein the stabilized, destructured ferroelectric material particles and solution spinning the resulting solution to form fibers.

25 34. The method of Claim 23 which further comprises, after destructuring the ferroelectric material:

adding the mixture of liquid and stabilized, destructured ferroelectric material particles to a molten organic wax at a temperature sufficient to evaporate the liquid

30 35. The method of Claim 23 which further comprises, after destructuring the ferroelectric material:

removing the liquid from the stabilized, destructured particles; and
adding the stabilized, destructured particles to a molten organic wax.

36. The method of Claim 23 which further comprises, after destructuring the ferroelectric material:

removing the liquid from the stabilized, destructured particles;

redispersing the stabilized, destructured particles in water; and

5 adding the resulting dispersion to a molten organic wax at a temperature sufficient to evaporate the water.

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37. The method of Claim 34, in which:

the liquid is an aliphatic alcohol having no more than about ten carbon atoms;

10 the surfactant is an alcohol-soluble, tetraalkylammonium halide, ethoxylated alkylamine, or primary, secondary, or tertiary alkyl- or arylamine; and

the organic wax is a polyethylene wax.

38. The method of Claim 36, in which:

15 the liquid is an aliphatic alcohol having no more than about ten carbon atoms;

the surfactant is an alcohol-soluble, tetraalkylammonium halide, ethoxylated alkylamine, or primary, secondary, or tertiary alkyl- or arylamine; and

the organic wax is a polyethylene wax.

20 39. The method of Claim 23, in which destructuring is accomplished by means of a ball mill, attriter mill, or pin mill.

40. The method of Claim 29, in which the aliphatic alcohol is 2-propanol or 1-butanol.

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41. A filtration medium comprising the nonwoven web of Claim 20.

42. The filtration medium of Claim 41, in which the nonwoven web is adapted to remove particulate matter from a gaseous stream.

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43. The filtration medium of Claim 41, in which the nonwoven web is a component of a heating, ventilating, and air conditioning filter.

44. The filtration medium of Claim 41, in which the nonwoven web is a component of an air conditioning or heating filter.

45. The filtration medium of Claim 41, in which the nonwoven web is a component of a high efficiency particle abstraction filter.

46. The filtration medium of Claim 41, in which the nonwoven web is a component of an automotive air filter.

47. The filtration medium of Claim 46, in which the nonwoven web is a component of an automobile engine air filter.

48. The filtration medium of Claim 46, in which the nonwoven web is a component of an automobile cabin air filter.

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49. A vacuum cleaner bag comprising the nonwoven web of Claim 20.

50. A face mask comprising the nonwoven web of Claim 20.

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51. The face mask of Claim 50, in which the mask is a medical face mask.

52. A respirator comprising the nonwoven web of Claim 20.

53. A dust wipe comprising the nonwoven web of Claim 20.

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